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(54) Web material dispensing apparatus

(57) Paper dispensing apparatus comprises a web feed system in combination with a roll transfer system for dispensing paper from successive rolls thereof. The web feed system comprises, on respective shafts (16, 26), two pinch rollers (8, 10), in the nip of which is the paper sheet. Fast with roller (8) is a disc (32) on which is eccentrically disposed a button (34) attached to one end of a spring (50) anchored

at its other end. The paper sheet is pulled manually, rotating roller (8) against the bias of spring (50) until a stop (36) engages a catch (39) on a sprung arm (38) having a push button (40). The length of paper is then torn off. Pushing button (40) releases the stop (36), so that a short length of paper is ejected for the above pulling. The roll transfer system comprises a spring roller contacting a first paper roll (4). Through a latch system, a transfer roller (76), holding the free end of a further paper roll, not shown, introduces the free end into the nip of rollers (8, 10) once the first roll (4) is substantially exhausted.

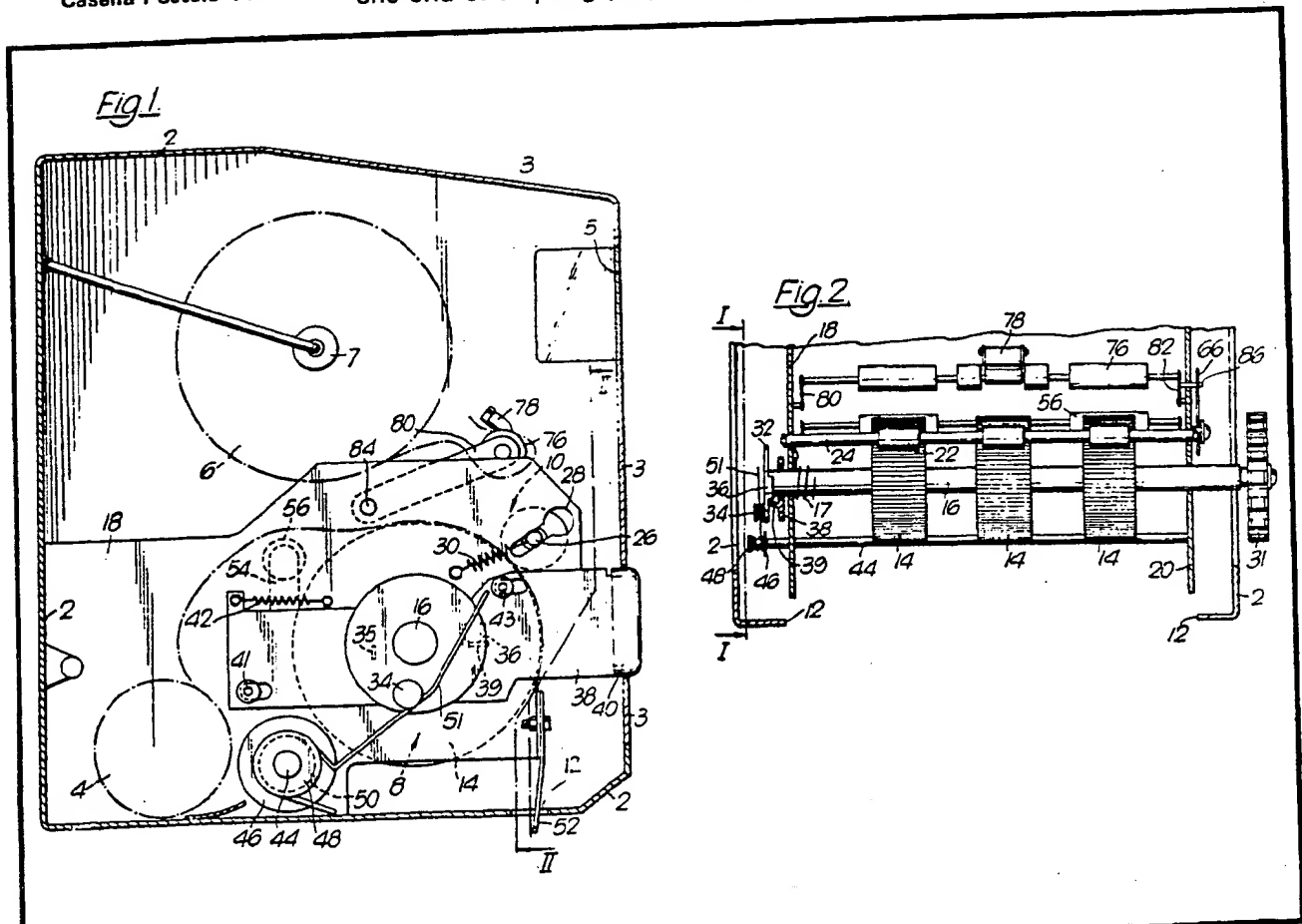


Fig. 1.

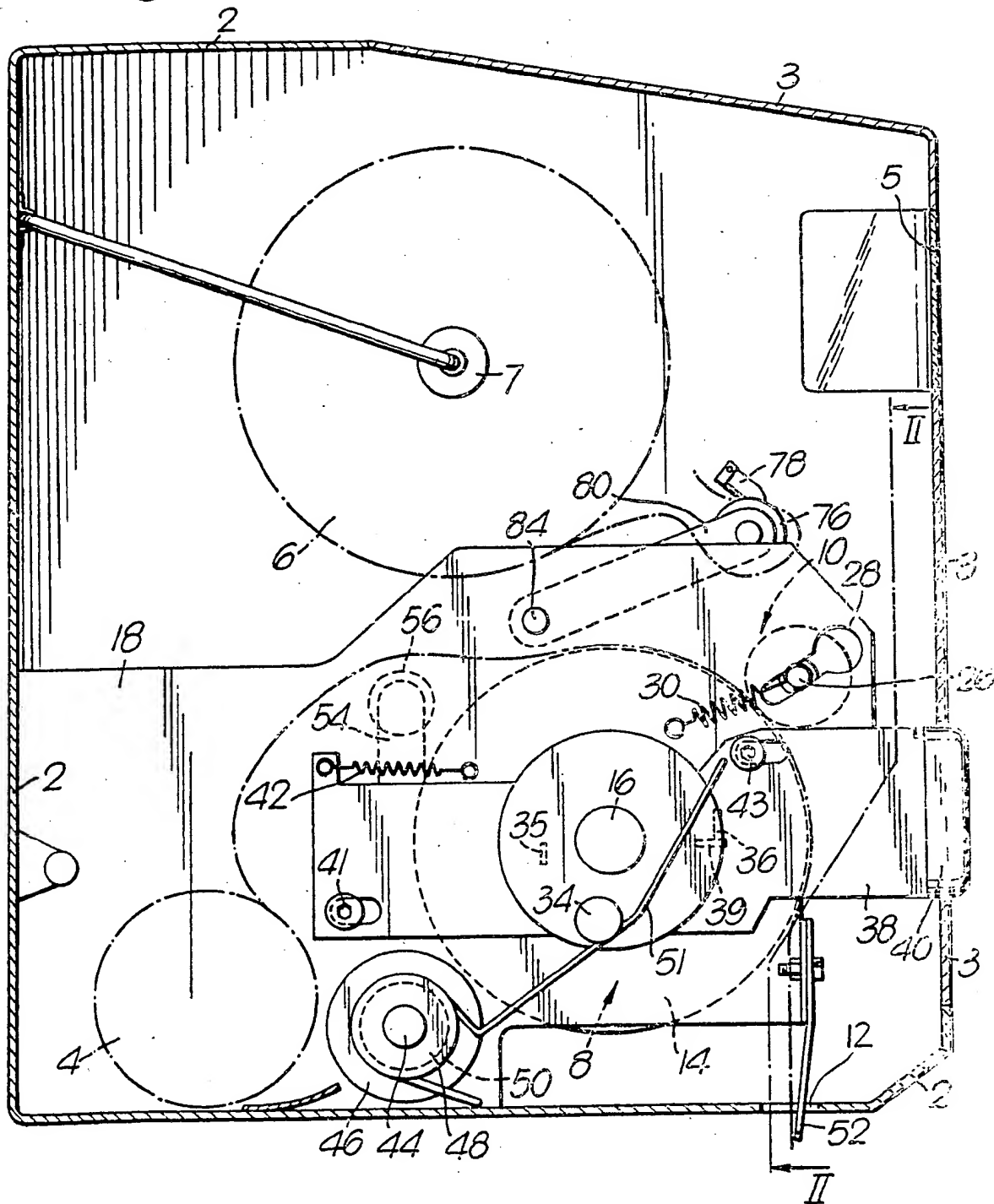
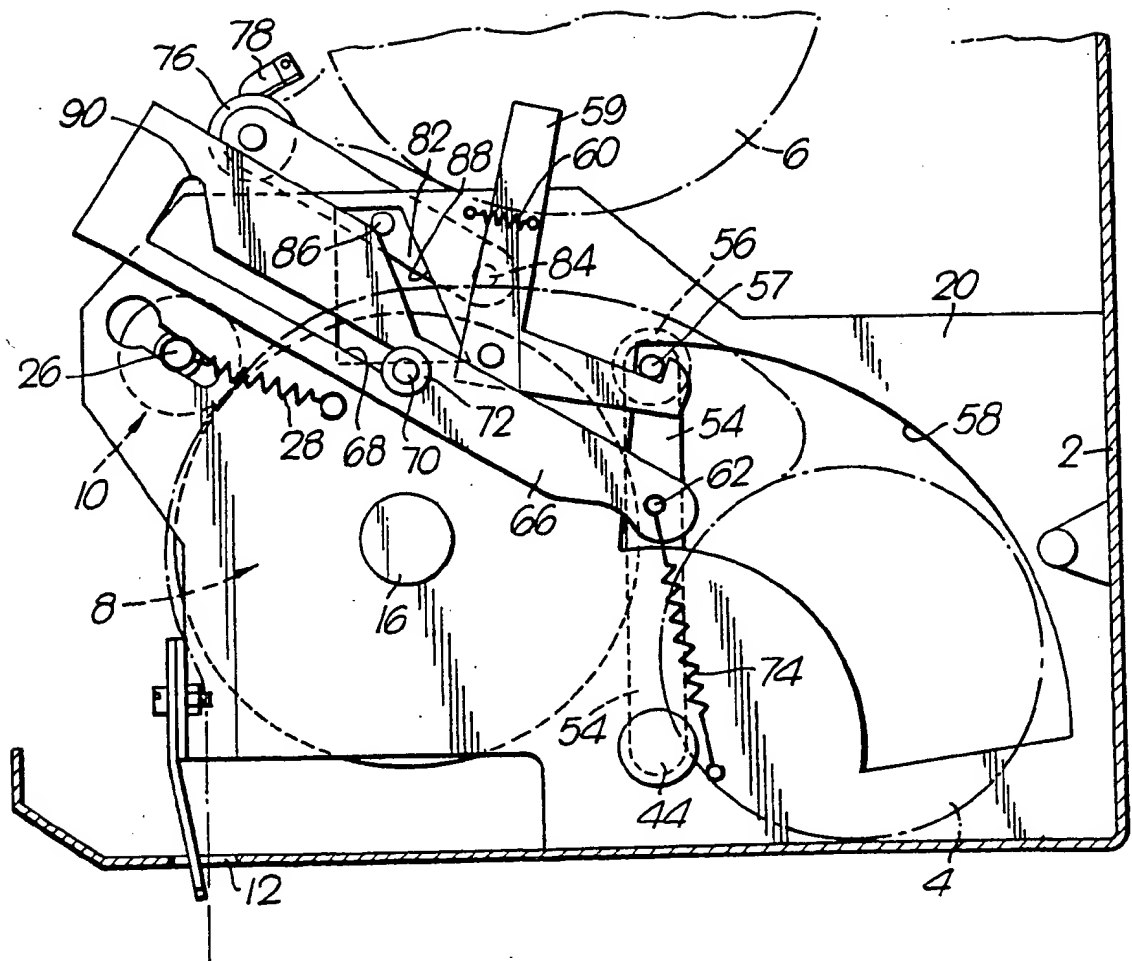


Fig. 4.

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Fig. 5.

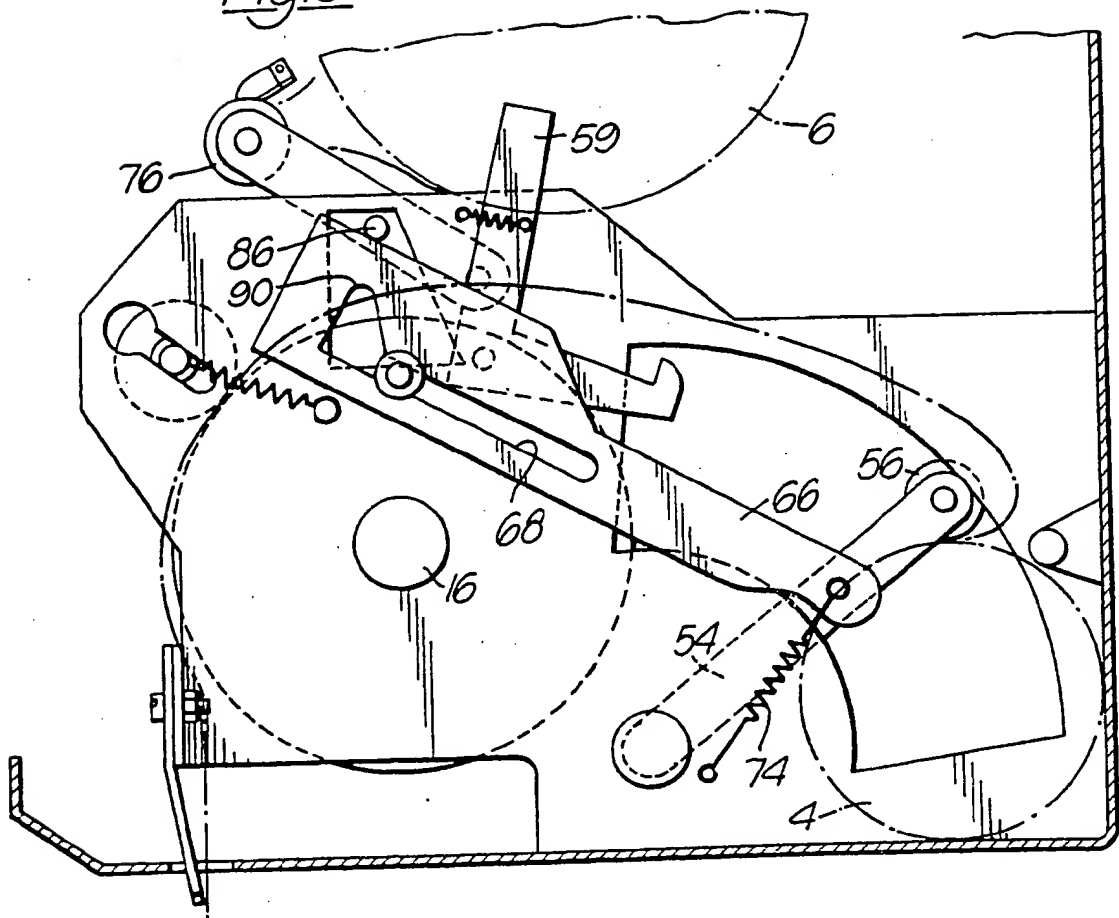
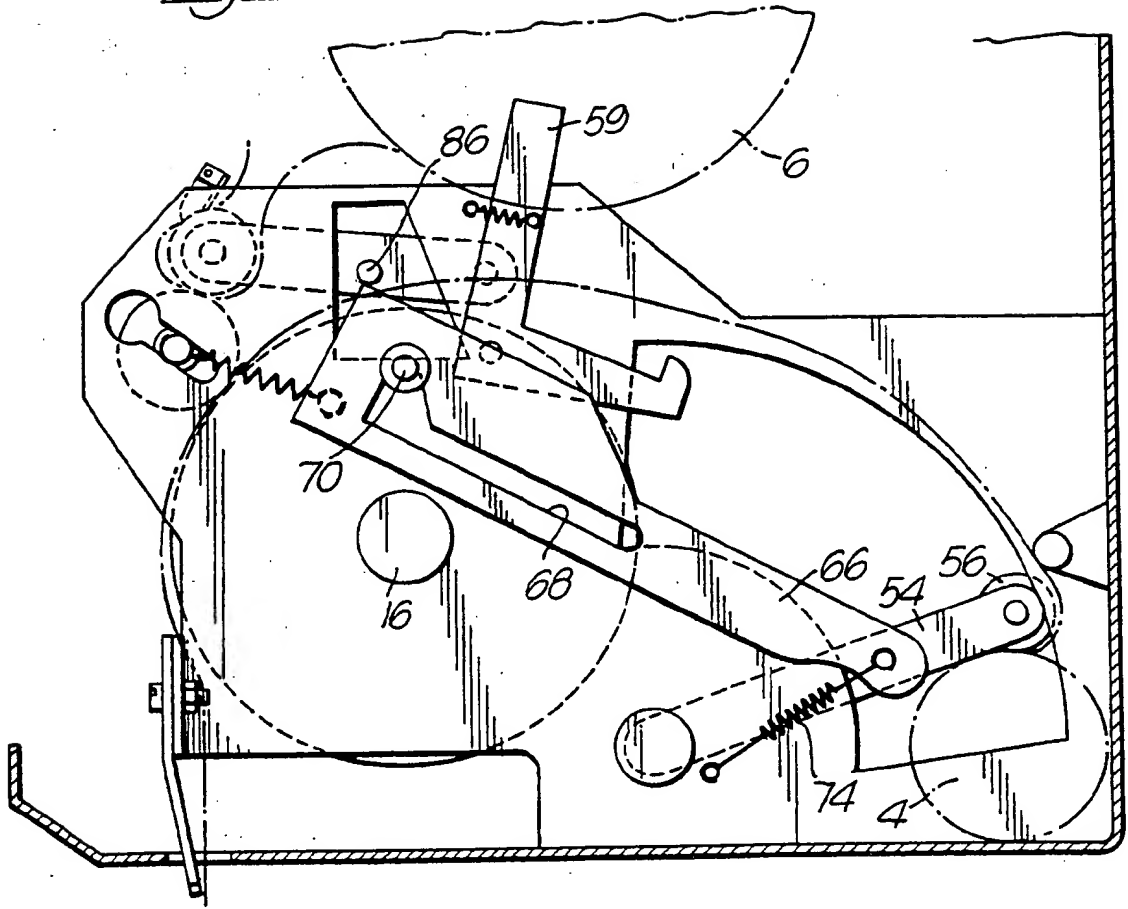


Fig. 6.

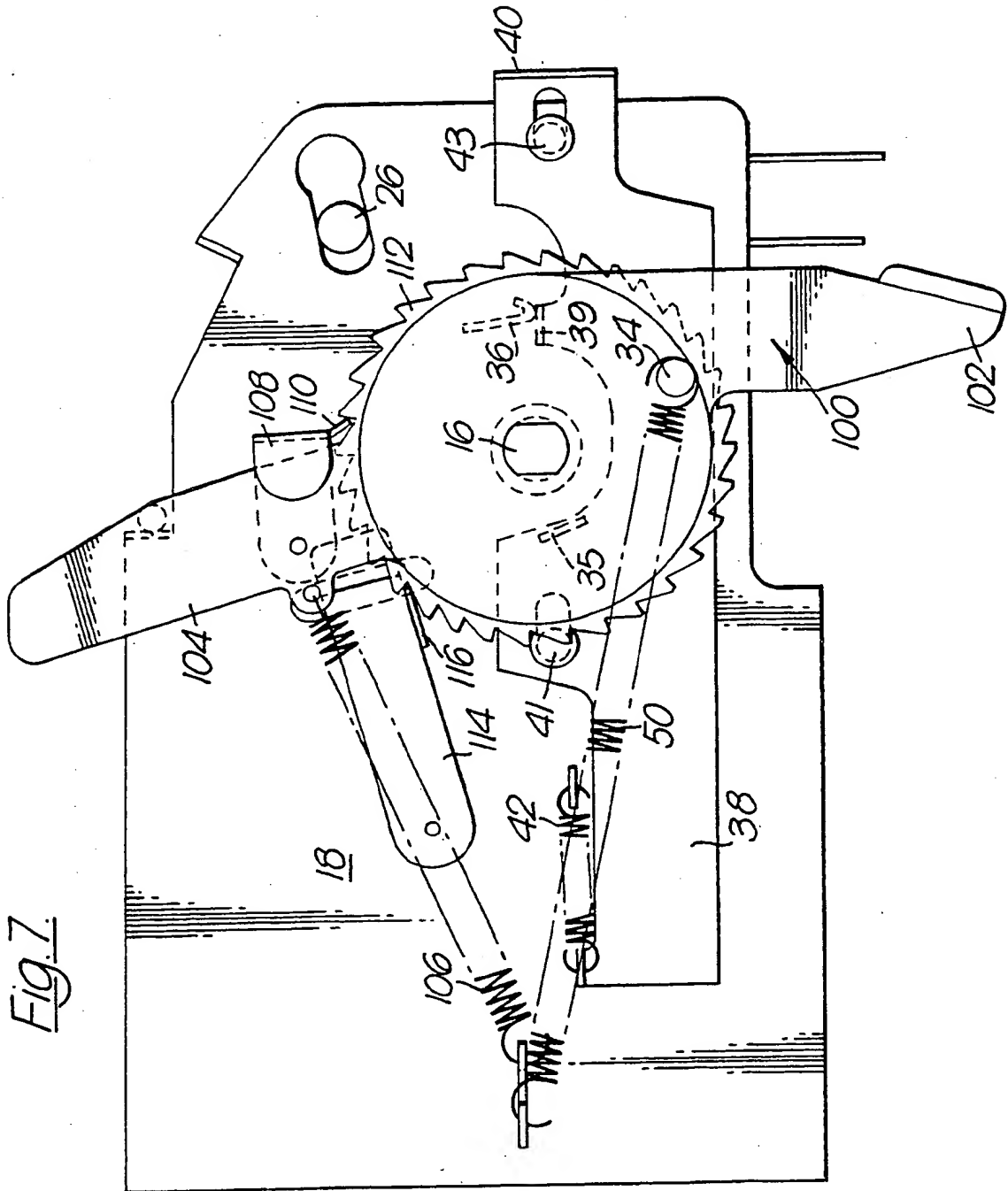
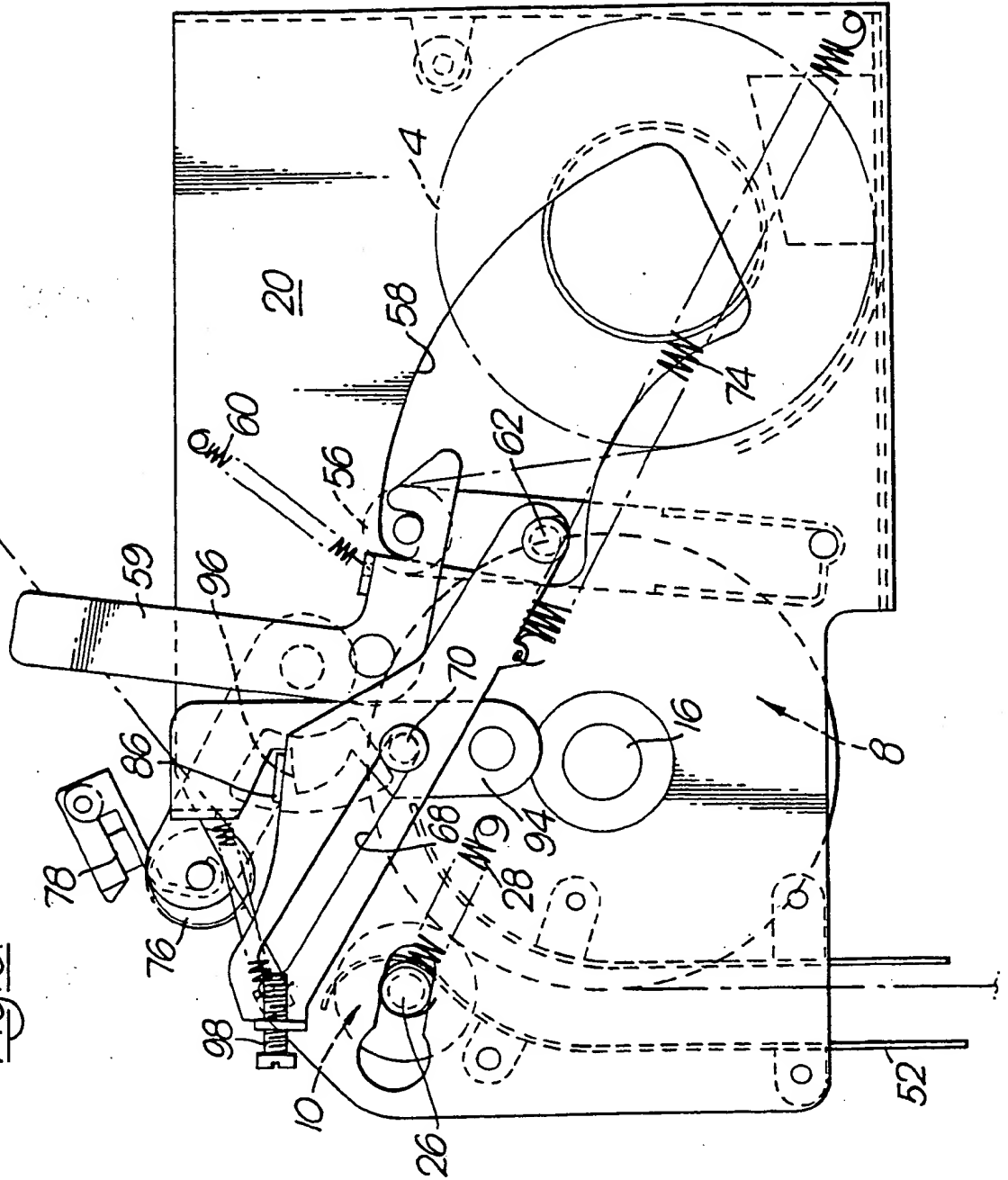
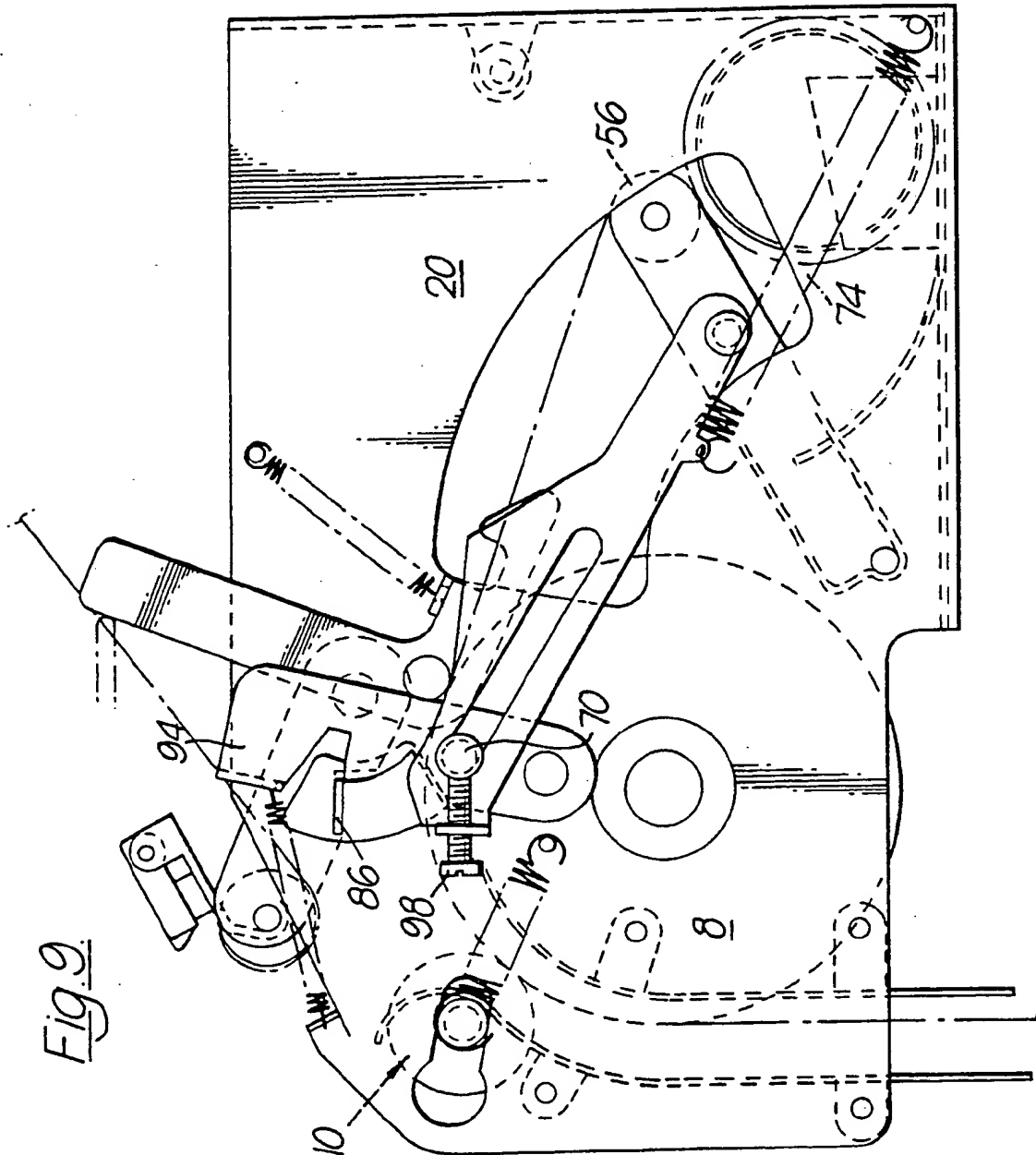
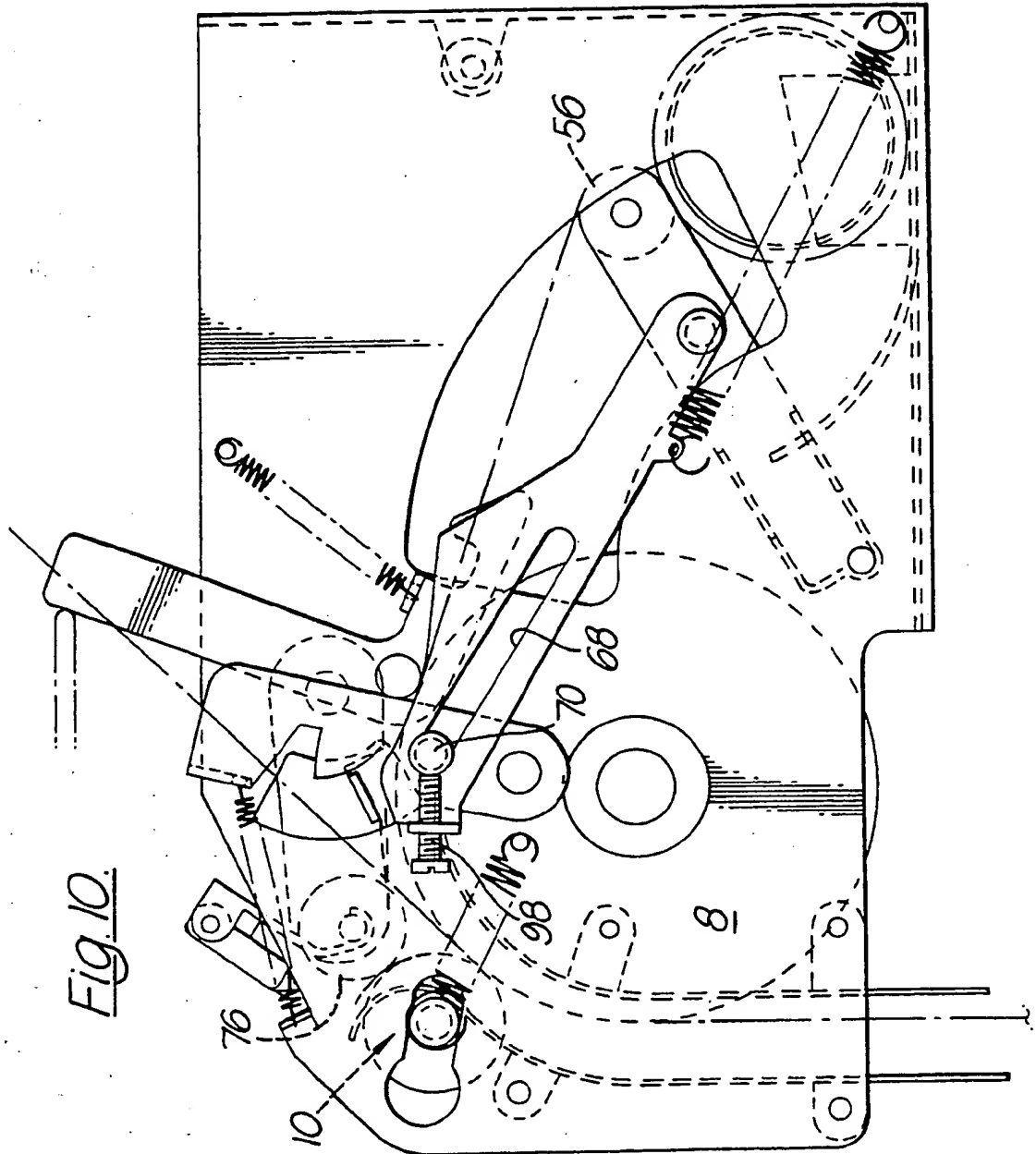


Fig. 7

Fig. 8







W b mat rial dispensing apparatus

40 The invention provides dispensing apparatus for dispensing successive lengths of web material, such as paper, from rolls of web material, which apparatus comprises a housing having means for supporting at least two
45 rotatable rolls of web material, a dispensing outlet through which the web material may be dispensed, and a web feed system including feed means for engaging web material as it is unwound from one roll and dispensing the
50 web material in a dispensing direction through the dispensing outlet, drive means including energy storage means and operably connected to the feed means to impart feeding movement to the feed means by release of stored
55 energy during a first part of a dispensing operation, and arranged to re-store energy when the feed means is actuated by manual withdrawal of web material during a second part of the dispensing operation, stop means
60 limiting the extent to which the web may be withdrawn during said second part of the dispensing operation so that the dispensed length of web may then be torn off, a manually operable release device for initiating a

The stop means suitably comprises a stop member eccentrically disposed on, and rotationally fast with, one of the two substantially parallel rollers, the stop member being engageable with a catch moveable in and out of the circular path described by the stop member when the said one roller rotates. Advanta-

geously, the manually operable release device includes a slidable arm having secured thereto the catch.

Suitably, the dispensing apparatus further comprises shaft advance means for turning one of the rollers to dispense paper, the shaft advance means being rotationally fast with the shaft of the said one roller, and comprising either a knurled wheel at least partly protruding through the housing and available to a user, or more preferably, a ratchet wheel engaged with a pawl operable by a spring lever protruding through the housing.

Suitably, the transfer system further includes a latch member operably connected to the sensing means and an abutment responsive to movement of the latch member and arranged to hold the transfer means away from the feed means until web material from said another roll is required.

Preferably, the sensing means is arranged to move to maintain contact with said one roll as web material is dispensed from the roll.

Preferably the sensing means forms part of a pivoted linkage arranged to move said latch member as the sensing means moves.

Embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings in which:-

Figure 1 shows one side of a first embodiment of the invention, viewed from line I-I of *Fig. 2*, showing a web feed system ready for dispensing paper from a lower roll;

Figure 2 is a front elevation of part of the apparatus of *Fig. 1*, viewed from line II-II of *Fig. 1*;

Figure 3 shows a side view of part of the apparatus in a view corresponding to that of *Fig. 1*, but after a short length of paper has been dispensed by a first part of a dispensing operation;

Figure 4 shows the apparatus of *Figs. 1* to *3* viewed from the other side, to show a transfer system which is in an inoperative position allowing insertion of a new lower roll;

Figure 5 shows a view corresponding to that of *Fig. 4*, but with the transfer system in an operative position shortly before transfer from the lower roll to the upper roll;

Figure 6 shows the apparatus viewed as in *Figs. 4* and *5*, after the transfer system has moved to commence feed from the upper roll;

Figure 7 shows part of a second and preferred embodiment viewed as in *Fig. 1*;

Figures 8, 9 and 10 show a second and preferred form of transfer system in views corresponding to *Figs. 4, 5* and *6*.

The dispensing apparatus generally comprises a cabinet having a housing 2, which is intended to be secured to a vertical wall, and a removable cover 3, *Fig. 1*, which is releasably securable to the housing 2. Within the cabinet are means for rotatably supporting a lower roll 4 on the floor of housing 2 and an

upper roll of paper 6, on stub shafts 7.

Also within the cabinet are located a web feed system (*Figs. 1* and *3*, or *7*) for feeding paper from one of the two paper rolls 4, 6 and a roll transfer system (*Figs. 4* to *6* or *Figs. 8* to *10*) for initiating paper supply from the upper roll 6, once the paper from the lower roll 4 is completely, or nearly completely exhausted. The cabinet cover 3 is readily removable from the housing 2 so that two new paper rolls may be inserted once the upper roll 6 is finished as well. The cover has a transparent region 5, enabling the upper roll to be viewed from outside the cabinet, so that it is known when to refill the cabinet.

Referring particularly to *Figs. 1* to *3*, there is shown the web feed system of the dispensing apparatus. The system includes two substantially parallel, rotatably mounted rollers 8 and 10 arranged to form a pressure nip through which the paper is drawn before being dispensed through a slot 12 in the housing 2. The first roller 8 has three drums 14, made of rubber, with a knurled periphery and irrotatably mounted on a shaft 16. The shaft 16 is rotatably mounted via bearings in two parallel, spaced support plates 18, 20. A spring 17 is fastened by one of its ends on the plate 18 (*Fig. 2*) and is wound around the shaft 16 in a direction so that it tightens on the shaft 16, if the shaft is rotated anti-clockwise (as viewed in *Figs. 1* and *3*) thus permitting rotation of the shaft 16 in a clockwise direction only. The second roller 10 has three rubber drums 22, each of which is arranged to press against a corresponding drum 14. The drums 22 are irrotatably mounted on a rod 24, having reduced diameter ends 26, each of which protrude through a key-hole shaped slot 28 and has attached thereto one end of a coil spring 30. The other ends of the coil springs 30 are attached to posts on the support plates 18, 20.

To one end of the shaft 16 is irrotatably secured a disc 32, having near its periphery a button 34 protruding from the face away from the shaft 16. On the opposite face of the disc 32, at the disc's periphery and spaced approximately 90° from the button 34 is a stop 36. An arm 38, having a catch 39 extending from its face opposite the disc 32, and having a push-button 40 at one of its ends, is slidably mounted on the support plate 18 via bolts 41 and 43 captive in slots in the arm 38. A coil spring 42 is fastened to both the support plate 18 and the arm 38 to bias the arm towards the right-hand side of *Figs. 1* and *3*. The catch 39 is arranged on the arm 38 so as to be disposed in the circular path of the stop 36, when the arm is biased to the right, as viewed in *Figs. 1* and *3*. A second stop 35 is arranged on the same face of the disc 32 as the stop 36 and disposed diametrically opposite stop 36 but closer to the disc's centre, at a position where the catch 39 is

disposed in the circular path of the stop 36, when the push-button 40 is pressed in to move the arm 38 leftwardly.

The end of the shaft 16 opposite that carrying the disc 32, protrudes from the housing 2 and has irrotationally secured thereto a knurled wheel 31 (Fig. 2).

A shaft 44 is mounted between the support plates 18, 20 and extends through the plate 18 to pass through two washers 46 and 48, having therebetween a spring 50, one end portion of which rests against the cabinet housing 2 and the other end portion 51 of which extends in a direction to urge against a circumferential groove in the button 34.

The paper is unwound from either the roll 4 (as illustrated) or roll 6 and threaded between rollers 8 and 10, then between the roller 10 and a tear plate 52 having a serrated lower edge, and finally through the slot 12.

The other end of the apparatus is shown in Figs. 4 to 6, which illustrate one embodiment of the roll transfer system. At either end of the shaft 44 is pivoted an arm 54. The ends of the arms 54 remote from the shaft 44 rotatably support a shaft of a follower roller 56, the function of which is to monitor the diameter of the lower roll 4 and to activate the roll transfer system once the diameter has reduced to a predetermined critical value where only a small amount of paper remains on the roll 4. One end 57 of the shaft of the follower roller 56 protrudes through an opening 58 in the support plate 20. In Fig. 4 the follower roller 56 is held by its shaft end 57 in an inoperative position by means of a cranked lever 59, having a hooked end, pivoted on the support plate 20 and biased by a spring 60 in an anti-clockwise direction. The lever 59 is automatically disengaged from the shaft end 57 by the cover 3, while the cover is being mounted on the housing 2. The cover 3 abuts an upright arm of the lever 59, turning it clockwise against the spring bias. A post 62 on the arm 54 which is adjacent support plate 20 extends through the opening 58 in the support plate 20. On the post 62 is pivoted a cam member 66 having a slot 68 therein. The cam member 66 is slidably mounted on the support plate 20 by means of a stub 70 extending from the plate 20 through the slot 68, the cam member being retained on the stub 70 by a washer 72. The cam member 66 is urged downwardly and to the right-hand side, as viewed in Figs. 4 to 6, by a coil spring 74.

In all the Figs. the paper is being supplied from the lower roll 4, while the upper roll 6 is in reserve, rotatably supported on stub shafts 7 with its free end of paper being wrapped around a transfer roller 76. A magnet 78 releasably holds the free end of the paper against the roller 76. The transfer roller 76 is supported on the support plates 18, 20, by

at 84 on support plates 18, 20 respectively. A lug 86 extends from the member 82 through an opening 88 in the support plate 20 to rest on the upper edge of the cam member 66.

The roll transfer system is held in the inoperative position of Fig. 4 when inserting a new paper roll 4. Once the roll is inserted the cranked lever 59 is pushed in a clockwise sense to release the follower roller 56 in a clockwise direction down onto the surface of the roll 4. The paper roll is dispensed, in a manner which will be described fully below, until its diameter decreases to a value as shown in Fig. 5. The arms 54 have pivoted in a clockwise direction, the cam member 66 has pivoted relative to the arms 54 and has slid downwardly and to the right-hand side as viewed in Figs. 4 to 6 by relative movement between the slot 68 and the stub 70. The cam member has also slid relative to the lug 86, which has remained in the same position.

In Fig. 6, the lower roll 4 has reached a critical diameter and the follower roller 56, urged into contact with the periphery of roll 4 by the spring 74, has pulled the cam member 66 downwardly and to the right-hand side to such an extent that the stub 70 has slid out of slot 68 and into a recess 90 at the end of the slot 68. This results in the cam member being pulled suddenly downwardly by the spring 74, so that the lug 86, resting on the top edge of the cam member, and hence the transfer roller 76 is correspondingly allowed to fall under gravity. The transfer roller 76 presents the loop of paper around it to the nip between the rollers 8 and 10. Paper from roll 6 is pulled by friction between the rollers 8 and 10 along with the small length of paper remaining on roll 4, so that the user has double thickness of paper until the roll 4 is completely exhausted. Transfer has then been completed and paper continues to be dispensed from the upper roll 6.

Paper is dispensed from either roll 4 or 6 by means of the web feed system previously described. The dispensing operation of the apparatus is a two-part operation. A user presses the push-button 40, which feeds a short length of paper out through the slot 12 which is sufficiently long for the user to grasp; the paper is then pulled downwardly in the second part of the dispensing operation to extract a further length of paper. The total paper thus dispensed may then be torn off against the tear plate 52.

In Fig. 1, the apparatus is ready for use. The previous user will have pulled paper through the slot 12, thus rotating the drums 14 of roller 8 clockwise, as viewed in Figs. 1 and 3, because the paper is gripped by the drums 14 and 22. Rotation of the drums 14 causes rotation of the shaft 16 on which they are mounted, and hence rotation of the disc 32 from its position shown in Fig. 3, to that

of Fig. 1. The button 34 will have moved round, its circumferential groove sliding along the end portion 51 of spring 50 and urging it downwardly to increase stress in the spring 50 until the button 34 has moved past a dead-centre point. Immediately past the dead-centre position, the button 34 will have been urged round under the action of the previous user pulling on the paper; in addition to the spring action of end 51 of the spring returning a short distance. Abutment of the stop 36 against the catch 39 halts the disc 32 and hence the roller 8 against rotation and the web feed system is now in the position of Fig. 1, with the spring 50 still stressed. Since the roller 8 is not halted until the button 34 has moved past its dead-centre position, the dead-centre position being where the spring is at its maximum stress, the shaft 16 will tend to rotate in one direction in preference to the other to deliver, and not retract, paper. Reverse rotation is, any case, prevented by the spring 17. A further advantage of locking after the dead-centre position has been passed is that it is clear to a user when the length of paper to be dispensed in the second part of the dispensing operation has been withdrawn, because the roller 8 comes to an abrupt halt. The previous user will then have torn off the total length of paper dispensed in the dispensing operation against the edge of the tear plate 52.

Until the next user comes along, the paper is kept within the housing, virtually no paper being exposed through the slot 12. The next user first presses the push button 40 inwardly, to slide arm 38 and hence catch 39 leftwardly, to free the circular path of the stop 36. Since the spring 50 is under stress, its end portion 51 urges the button 34 in a clockwise direction, thus turning disc 32, shaft 16 and drums 14, to deliver a short length of paper thereby effecting the first part of a dispensing operation. The short length is sufficient to enable the user to grasp it and pull on the length of paper exposed through the slot 12 until the stop 36 comes to rest against the catch 39, and the length of paper delivered by one full revolution of the drums 14, i.e. equal to their circumference, may be torn off thereby completing the dispensing operation. If a greater length of paper, i.e. a length which is a multiple of the drums' circumference, is required, several dispensing operations may be effected by pushing the button 40 repeatedly, the paper being pulled out between each push of the button 40 until the desired length of paper is dispensed. It is then torn off against the tear plate 52.

In the event of mis-use of the apparatus, for instance by a user tearing paper off after pushing button 40, but before pulling on the short length ejected by pushing button 40, the shaft 16 and hence the paper caught in the nip of rollers 8 and 10 can be advanced

by turning the wheel 31 towards the user.

For preventing a user simply pressing continuously on button 40 and pulling on the paper to withdraw a continuous length by avoiding locking between stop 36 and catch 39, the second stop 35 is arranged on the disc at a distance from the disc's centre, so that when the button 40 is pushed in, the catch 39 on the arm 38 lies in the circular path of stop 35. Only by releasing button 40 can further paper be pulled through slot 12.

Once both paper rolls 4 and 6 have been fully dispensed through the slot 12, the cabinet cover 3, which may be lockable with the housing 2, is removed and the roll transfer system put into the position of either Fig. 4 or 8, by urging the follower roller 56 upwardly in opposition to the force of the spring 74, until the end 57 of the follower roller shaft is caught in the hooked end of the cranked lever 59. Once in this position, a new lower roll 4 may be inserted either way round, resting it on the floor of the cabinet housing 2. The apparatus works equally well with the rolls 4, 6 unwinding in either direction, and Figs. 1 and 3 show roll 4 unwinding in opposite directions. The free end of roll 4 is extracted, placed in the nip of rollers 8 and 10 and fed between the rollers by turning the wheel 31, until sufficient paper protrudes through the slot 12 to be gripped by a user. A fresh upper roll 6 is then mounted on its stub shafts 7.

Fig. 7 illustrates an alternative embodiment, but features having equivalent functions to those of the embodiment of Figs. 1 to 3 are denoted by like reference numerals.

Instead of a wheel 31 fast with the shaft 16 for advancing the shaft, and hence the paper caught in the nip of rollers 8 and 10, there is shown a lever 100 rotatably mounted on the shaft 16, the lever having a lower part 102 and an upper part 104 extending away from the shaft 16. The upper part 104 is urged leftwardly by a spring 106 to bias the lever in an anti-clockwise direction, as viewed in Fig. 7. On the upper part 104 is pivoted a pawl 108 having a lug 110 engageable with the teeth of a ratchet wheel 112 fast with shaft 16. By pressing leftwardly (as viewed in Fig. 7) on the lower part 102 of the lever, protruding from the cabinet housing 2, the wheel 112 and hence the shaft 16 will be nudged in a clockwise direction by the lug 110 caught between two teeth of the wheel 112. Once the sprung lever 100 is released, the pawl 108 will move out of the way of the teeth and then drop back under gravity between two teeth. The lever 100 may be pressed repeatedly to further advance paper through slot 12. Instead of the spring 17 for preventing reverse rotation of the shaft 16, there is a member 114 pivoted on the support plate 18 and having a flange 116 extending into the circular path of the teeth of the ratchet wheel 112.

Instead of the spring 50, 51 of Figs. 1 to 3, there is provided a coil spring 50, secured at one of its ends to the support plate 18 and at its other end to an eccentric location, e.g. the button 34, on the disc 32.

Figs. 8 to 10 illustrate an alternative form of transfer system. Again, like reference denote like features. The means for activating the transfer system differ in this embodiment. Instead of the lug 86 always resting directly on the cam member 66, there is an intermediate lever 94 pivoted on the support plate 20. The stub 70 is secured to the lever 94 instead of to plate 20. The lever 94 has a lip 96 which accepts the lug 86 once the upper edge of cam member 66 has moved downwardly from the position of Fig. 8 to that of Fig. 9. Also, instead of the recess 90 accommodating the stub 70, as in Fig. 6, activation of the transfer system occurs when the end of slot 68 abuts the stub 70 to pivot lever 94 out of the way of the lug 86, to allow the lug and hence the transfer roller 76 to fall into the nip of rollers 8 and 10 to effect the transfer, by the roller 76 pressing the paper from roll 6 into contact with the paper running from roll 4 and disposed on the roller 8. An adjustment screw 98 may effectively lengthen or shorten the slot 68 to activate transfer at different critical diameters of the lower paper roll 4.

Clearly the web feed system of Figs. 1 to 3 can be used in conjunction with the transfer system of either Figs. 4 to 6 or of Figs. 8 to 10, and the feed system of Fig. 7 with either transfer system.

Although only two paper rolls are described and illustrated as being contained in the cabinet, three or more rolls could be arranged to dispense paper sequentially from the rolls.

CLAIMS

1. Dispensing apparatus for dispensing successive lengths of web material, such as paper, from rolls of web material, which apparatus comprises a housing having means for supporting at least two rotatable rolls of web material, a dispensing outlet through which the web material may be dispensed, and a web feed system including feed means for engaging web material as it is unwound from one roll and dispensing the web material in a dispensing direction through the dispensing outlet, drive means including energy storage means and operably connected to the feed means to impart feeding movement to the feed means by release of stored energy during a first part of a dispensing operation, and arranged to restore energy when the feed means is actuated by manual withdrawal of web material during a second part of the dispensing operation; stop means limiting the extent to which the web may be withdrawn during said second part of the dispensing operation so that the dispensed length of web

released vice for initiating a dispensing operation, said release device being operable to release said stop means and to actuate the drive means to release said stored energy and thereby dispense sufficient length of web material in the first part of the dispensing operation to allow the web material to be manually gripped and then pulled to complete the second part of the dispensing operation, said apparatus further comprising a transfer system for transferring into operative engagement with the feed means the free end of a web of another roll in said housing when all, or substantially all, the web material of said one roll has been dispensed so that the material may be dispensed from the rolls in sequence, said transfer system including sensing means for sensing the diameter of said one roll and transfer means for engaging the said free end of a web and moving it into engagement with the feed means when the sensing means senses a predetermined size of said one roll.

2. Dispensing apparatus as claimed in Claim 1, further comprising preventing movement of the feed means which would induce movement of the web material in the direction opposite to the dispensing direction.

3. Dispensing apparatus as claimed in either Claim 1 or 2, in which the feed means comprises a pair of substantially parallel rollers which are biased into mutual contact to form a nip, the web material being insertable in the nip of the two rollers to be in frictional contact therewith.

4. Dispensing apparatus as claimed in Claim 3, in which the means preventing movement of the feed means in a direction tending to retract the web material comprises a ratchet wheel irrotationally secured to a shaft of one of the substantially parallel rollers, the ratchet wheel being engageable with a pawl so as to prevent rotation of the shaft in a direction tending to retract the web material.

5. Dispensing apparatus as claimed in Claim 3, in which the means preventing movement of the feed means in a direction tending to retract the web material comprises a spring coiled around a shaft of one of the substantially parallel rollers, in a direction tending to tighten on the shaft when the shaft is turned in a direction tending to retract the web material.

6. Dispensing apparatus as claimed in any of Claims 3 to 5, in which the energy storage means comprises a coil spring, one end of which is fixed, the other end of which is secured to one of the two substantially parallel rollers at a location spaced from the roller's axis.

7. Dispensing apparatus as claimed in any of Claims 3 to 5, in which the drive means comprises an abutment member disposed eccentrically of and rotationally fast with one of the two substantially parallel rollers, and the energy storage means is a spring, one end

portion of which is fixed, the other end portion being in abutment and in sliding contact, with the abutment member.

8. Dispensing apparatus as claimed in any preceding claim, in which the stop means comprises a stop member eccentrically disposed on, and rotationally fast with, one of the two substantially parallel rollers, the stop member being engageable with a catch movable in and out of the circular path described by the stop member when the said one roller rotates.

9. Dispensing apparatus as claimed in Claim 8, in which the manually operable release device includes a slidable arm having secured thereto the catch.

10. Dispensing apparatus as claimed in any preceding claim, further comprising shaft advance means for turning one of the rollers to dispense paper, the shaft advance means being rotationally fast with the shaft of the said one roller.

11. Dispensing apparatus as claimed in Claim 10, in which the shaft advance means comprises a ratchet wheel engaged with a pawl operable by a spring lever protruding through the housing and available to a user.

12. Dispensing apparatus as claimed in Claim 10, in which the shaft advance means comprises a knurled wheel at least partly protruding through the housing and available to a user.

13. Dispensing apparatus as claimed in any preceding claim, in which the transfer system further includes a latch member operably connected to the sensing means and an abutment responsive to movement of the latch member and arranged to hold the transfer means away from the feed means until web material from said another roll is required.

14. Dispensing apparatus as claimed in any preceding claim, in which the sensing means is arranged to move to maintain contact with said one roll as web material is dispensed from the roll.

15. Dispensing apparatus as claimed in either Claim 13 or 14, characterised in that the sensing means forms part of a pivoted linkage arranged to move said latch member as the sensing means moves.

16. Dispensing apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.